Reg. No.										

MANIPAL INSTITUTE OF TECHNOLOGY

MANIPAL

A Constituent Institution of Manipal University

FIRST SEMESTER M.TECH. (AEROSPACE ENGINEERING)

END SEMESTER EXAMINATIONS, NOV/DEC 2016

SUBJECT: NAVIGATION AND GUIDANCE OF AEROSPACE VEHICLES [ICE 5104]

Time: 3 Hours MAX. MARKS: 50

Instructions to Candidates:

- Answer **ALL** the questions.
- Missing data may be suitably assumed.

1A. An aircraft is flying on a straight-line leg of 73 Nautical miles between two points with a course of 215 degree as measured using a map. Local magnetic deviation is (-11^0). Aircraft will fly at 12000 feet with a true air speed of 165 knots. Aircraft is flying in air that has wind from 350^0 at 25 knots. Calculate the time of flying. **5**

1B. With diagram, explain NGC loop. List the applications of navigation, guidance and control systems **3**

1C. Write about following navigation methods: **2**

(i) Dead Reckoning (ii) Celestial Navigation

2A. Explain inertial navigation system. What is stable platform INU and strapdown INU. List the advantages of strapdown system. **5**

2B. Position vector P_A (1, 2, 3) of an aircraft, represented in ECI frame (frame A) need to be transformed to body frame (frame B). The orientation of A and B co-ordinate frames are as shown in figure (2B). Perform the transformation using following techniques: **5**

(i) Euler angle transformation

(ii) Quaternions

3A. Write about integrated navigation system. What are the various types of navigational aids available for integrated navigation system? **5**

3B. Briefly explain the working of radio based navigation aid – VOR/DME. **3**

3C. Obtain the scale factor for a SDFG rate gyro. **2**

4A. Write about following guidance systems: **6**

(i) Inertial guidance

(ii) Homing guidance

(iii) Commanded guidance

4B. With diagram, explain the working of a Quartz-Flex accelerometer **4**

5A. Explain proportional navigation guidance. With intercept geometry, derive the generalized equation governing PN guidance. **5**

5B. With block diagram, explain decoupled and integrated GNC system architecture. **3**

5C. Briefly explain, roll stabilization system for a missile **2**

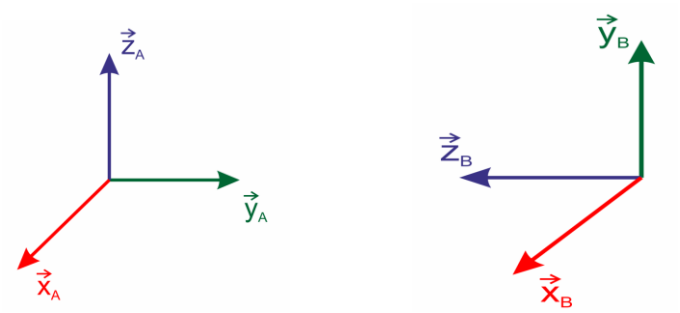

FIG. Q2B

********** END **********